NOISE IMPACT ASSESSMENT

for the

CHESTER HILL HOLDING MINE

Black Meadow Road property
Town of Chester
Orange County, New York

Prepared for:

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1.0 Introduction

This report is submitted in support of the application for coverage under the State Mined Land Reclamation regulations for a shale mine at the Chester Hill Holding property on Black Meadow Road.

The New York State Department of Environmental Conservation has prepared a policy document, entitled "*Assessing and Mitigating Noise Impacts*" (*Program Policy Memorandum DEP-00-3*; herein referred to as the *PPM*), as a guide to the evaluation of noise impacts on the community. According to the document, the *PPM* "**presents noise assessment methods, examines the circumstances under which sound creates significant noise impacts, and identifies avoidance and mitigative measures to reduce or eliminate noise impacts**". This assessment of noise impacts from the proposed Chester Hill Holding mine has been prepared in accordance with the *PPM*. Included in the analysis are potential noise impacts from the extraction and processing of shale; vibrations produced by blasting are evaluated in the *Blasting Plan* (under separate cover).

2.0 Noise Definitions and Metrics

Noise is commonly defined as unwanted sound, or sound that causes unwanted impacts. A noise assessment examines the nature of the sound that causes the impacts and reviews mitigation measures to reduce those impacts. Three components are typically evaluated in an assessment of such impacts. These are: 1) the source of the noise and its characteristics; 2) the mode and distance of transmission; and 3) the receptor(s) and its setting. The source of the vibrations producing the noise determines the loudness (sound pressure level), the frequency (in cycles per second or Hertz), and the duration. The medium of transmission (air, ground, or structures) affects the degree to which the noise reaches the receptor. The level of impact is commonly associated with the setting and nature of the receptor.

Noise descriptors are used to compare source characteristics. Sound is measured in decibels, which are units of pressure. Environmental noise measurements are usually "A-weighted" which means that the frequencies audible to the normal human ear (about 25 to 10,000 Hz) are given additional weight over higher or lower frequencies. Noise measurements are "C-weighted" (equal weighting at all frequencies) when a significant component of low frequency sounds may be present in the noise spectrum. C-weighting is typically used, for example, to monitor quarry blasting programs.

Various noise levels (L) are used to provide a metric for comparison of different sounds. The Equivalent Sound Level, or L_{eq}, compares a fluctuating sound to a steady state equivalent and is the most common metric used in environmental noise studies. The L_{max} indicates the highest instantaneous levels measured. The L_{10} gives the noise level that is exceeded 10% of the time, whereas the L_{90} gives the level that is exceeded 90% of the time. The L_{90} can also be considered the ambient or background level. The Community

Noise Equivalent Level (CNEL) evaluates sounds that occur 24-hours a day, adding a penalty to noises produced at night. Any reported noise value has to include both the noise level and the distance from the source at which the measurement was made, for comparison purposes.

Various factors affect the attenuation or reduction of sound as it is transmitted from the source to the receptor. The greatest attenuation is generally achieved by the loss of sound energy with distance. This is typically about 6 dB per doubling of the distance through the air from source to receptor. A more precise calculation is used in the *Attachments*. Physical barriers, vegetation, surface texture and composition, wind direction, temperature, and other factors can also result in the attenuation of sound. Solid barriers are commonly used to attenuate noise levels at offsite receptors; other attenuation factors may be effective under certain conditions. Attenuation formulae are presented in *Attachment 2*.

Decibels are logarithmic units and can not be averaged arithmetically. The following table provides the additive factors to use when evaluating adjacent sources of similar characteristics:

APPROXIMATE ADDITION OF SOUND LEVELS*

Difference between two sound sources	Add to the higher of the two sound levels
1 dB or less	3 dB
2 to 3dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0 dB

*Table A from *PPM*

3.0 Sound Characteristics

3.1 Ambient Noise Levels

The ambient noise environment in the vicinity of the Chester Hill Holding property is impacted by three primary components: 1) activities at commercial and industrial properties on adjacent and nearby parcels. The Waste Systems property and the industrial parks to the north and west of the subject site are the primary noise sources in the area, with associated heavy truck and equipment operations; 2) truck and automobile traffic on Black Meadow Road (west and north of the property) and on the Kings Highway (east of the property) are sources of noise at nearby houses; and 3) movements of trains on the Conrail tracks

3.2 Future Noise Levels at Source

Shale excavation requires the stripping of soil resources, drilling and blasting to fragment the bedrock, crushing and screening, and offsite trucking. Estimated noise levels for the shale extraction activities, based on information provided in the PPM, (see *Attachment 2*), are as indicated in the following table:

MINING EQUIPMENT SOURCE NOISE LEVELS (MEASURED*)

Source	Noise Level (Leq)	Distance (feet)
Dump Truck	85 dBA	50
Loader	85	50
Excavator	76	100
Crusher/Screener	81	100
Rock Drill	89	50

*see *Attachment #3* for data sources

3.3 Increase in Sound Pressure Level

The property has been vacant for many years, so the ambient noise level is controlled by activities on the adjacent industrial properties. The mine has been designed to mitigate noise levels to insure that there will be no significant increase in source sound levels above those previously produced on the site (see Section 6.0 and Section 7.0).

3.4 Sharp and Startling Noise

Sharp and startling noises are not characteristic of mining operations, including those with processing plants and crushers. High-energy, impulsive sounds, of the type produced by blasting, are generally low-frequency and contain most of their energy in 1 second and almost all of the energy is dissipated in 3 seconds (see *Blasting Plan* under separate cover).

3.5 Reaction to Frequency and Tone

Equipment used at an active mine face generally operates at a relatively low speed and produces noise in the lower octave bands. The sounds are generally in the lower portion of the range of hearing of the normal human ear; high frequency sounds are not typical at mines. The blast events will produce a low frequency rumble, similar to thunder (see *Blasting Plan* under separate cover).

3.6 Percentile of Sound Levels

Noise levels fluctuate as the shale is excavated, processed, and loaded out. Drilling will be conducted a few days before each blast.

3.7 Expression of Overall Sound

The A-weighted, equivalent sound level (dBA, L_{eq}) is the appropriate noise metric to use for community noise assessments (see *PPM*). The C-weighted community exposure level is used for impulsive sounds such as blasting. The excavation activities will not operate at night, therefore the day/night metric (L_{dn}) is not applicable.

4.0 Receptor Locations

The closest off-site receptors to the proposed Chester Hill Holding property are industrial and commercial sites to the west and north. Sensitive noise receptors commonly include:

- Schools
- Hospitals

- Rest Homes
- Long-Term Care facilities
- Mental Care facilities
- Residential Uses
- Libraries
- Areas dedicated to passive recreational uses
- Places of Worship

The Chester Town Library on the Kings Highway, Knapp's View Park on Kings Highway, and residences on Kings Highway and Black Meadow Road, are the closest identified sensitive land uses (see *Noise Receptor Map*).

OFFSITE RECEPTOR LOCATIONS

RECEPTOR (ABBREVIATION)	LOCATION	DISTANCE FROM PROPERTY LINE	DISTANCE FROM MINE LIMITS
Town Library (TL)	Kings Highway	1,660 ft	1,780 ft
Residence A (RA)	Kings Highway	1,275 ft.	1,360 ft.
Residence B (RB)	off Kings Highway	1,900 ft	2,100 ft
Residence C (RC)	Black Meadow Road	2,350 ft	2,480 ft
Knapp's View Park (KP)	Kings Highway	1,250 ft.	1,400 ft.

*see locations on *Noise Receptor Map*.

5.0 Threshold for Significant Sound Pressure Increase

The *PPM* provides information regarding the significance of sound level increases at receptors. The document states that the human reaction to sound pressure increases of fewer than 5 dB is unnoticed to tolerable.

HUMAN REACTION TO INCREASE IN SOUND PRESSURE LEVELS *

INCREASE IN SOUND PRESSURE	HUMAN REACTION
under 5 dB	Unnoticed to tolerable
5 to 10 dB	Intrusive
10 to 15 dB	Very noticeable
15 to 20 dB	Objectionable
over 20 dB	Very objectionable to intolerable

*Table B from NYSDEC *PPM*

6.0 Mitigation Factors

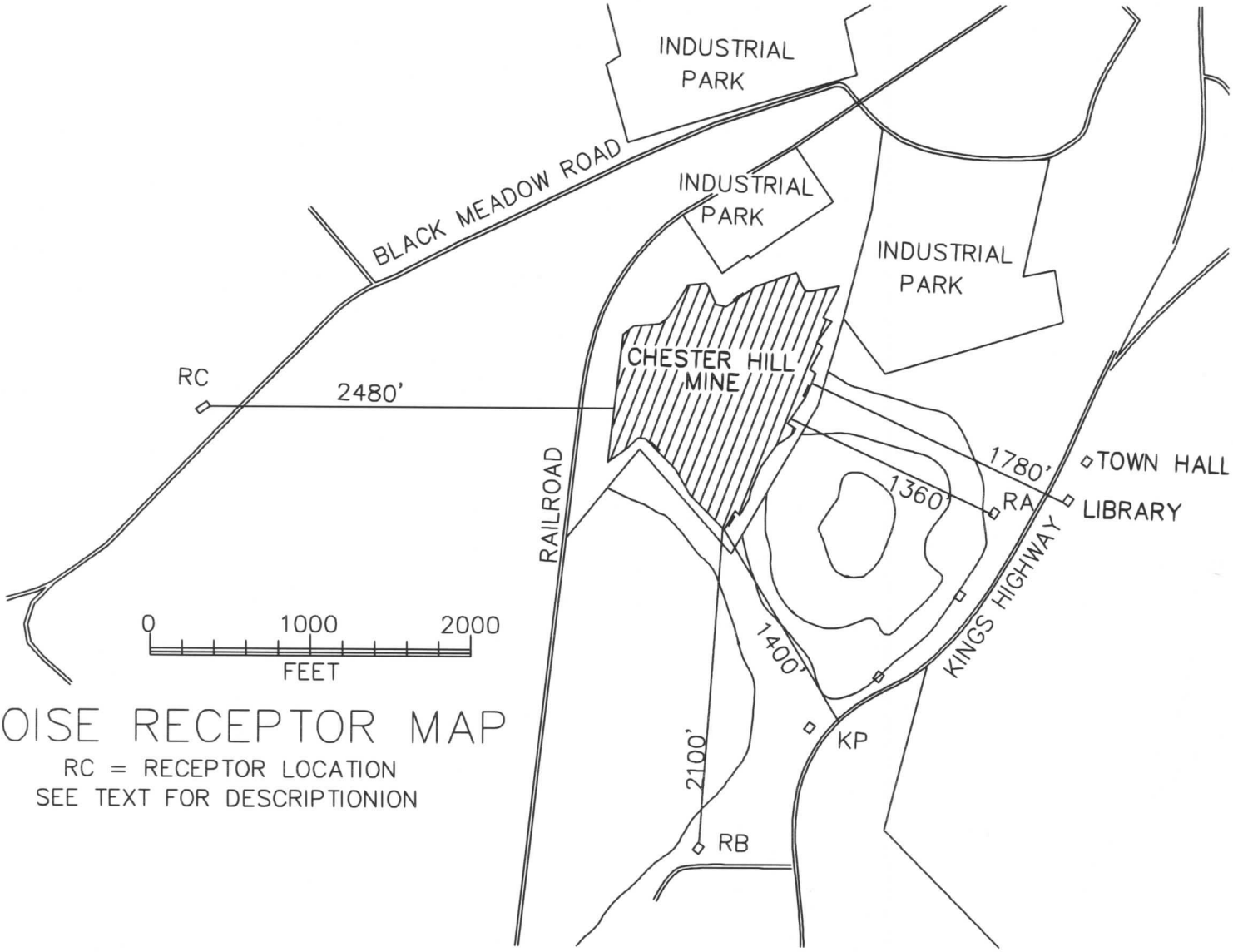
1. Noise Reduction at Source
   a. Design – There is little opportunity to reduce source noise at the facility. The equipment will be of a standard design; the intrinsic noise levels are determined by the design.
   b. Backup Alarms – MSHA-approved infrared or motion-sensitive backup alarms will be employed to reduce required sound levels.

c. Maintenance of Equipment – Mining equipment will be regularly maintained. OEM mufflers and noise shields will be used on the all equipment.
d. Noise Duration – Excavation activities will be limited to 7 am to 5 pm, Monday through Saturday. There are no operations on Sundays or the six major Federal holidays (New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas). The rock drill will be used for a few days before each blast.

2. Reduction of Noise Levels at Receptors
   a. Distance to Receptors – Initial excavation for the mine will be located in the northern part of the property, adjacent to the industrial park. The mine will be more than 1,200 feet from the nearest non-commercial receptors during the life of the mine (see Table in Section 4.0).
   b. Design – the mine is designed to maintain unmined rock between mining activities and most non-commercial land uses to the maximum extent practicable. Excavation of the rock will be directed eastward and southward, toward the receptors.
   c. Screening – Overburden berms will be constructed along the limits of the active mine area. The berms and stockpiles will augment the attenuate effects of the topography, especially during drilling activities.
   d. Aggregate stockpiles: Processed aggregate will be placed between the processing plant and sensitive off-site receptors.
3. Ambient Noise Environment
   a. The mine will operate in the context of the industrial sites and related traffic that have been part of the sound environment for many years.
   b. Traffic on Route 17 and other highways through and in the vicinity of the Village of Chester provide additional ambient noise sources impacting historic and recreational site..
   c. The occasional passage of trains through the community creates an infrequent but high decibel noise source to residential and non-residential properties in the area. The trains are required to audible warn drivers at grade crossings.

7.0 Conclusions

This *Noise Impact Assessment* documents that operation of shale mine on the Chester Hill Holding property will not create a significant noise impact at the nearest sensitive receptors. Mine–generated noise levels will be less than 50 dBA at the identified receptors; this is well within typical ambient levels.



NOISE RECEPTOR MAP

RC = RECEPTOR LOCATION
SEE TEXT FOR DESCRIPTIONION

Calculated Noise Levels at Receptor

SOURCE	RECEPTOR[1]	DISTANCE FROM SOURCE TO RECEPTOR[2]	NOISE LEVEL - DISTANCE ATTENUATION[3]	NOISE LEVELS -TOPOGRAPHIC ATTENUATION[3]
Rock Drill	Receptor TL	1,780	58	43
	Receptor A	1,360	60	45
	Receptor B	2,100	57	42
	Receptor C	2,480	55	40
	Receptor KP	1,400	60	45
Processing Plant w/ loader mine floor	Receptor TL	2.070	57	42
	Receptor A	1.860	58	43
	Receptor B	2,650	55	40
	Receptor C	2.820	54	39
	Receptor KP	2,090	57	42
Crusher w/ loader at face	Receptor TL	1,880	58	43
	Receptor A	1,460	60	45
	Receptor B	2.200	56	41
	Receptor C	2,580	55	49
	Receptor KP	1,660	59	44

Notes: [1] see *Receptor Map*; [2] in feet; [3] dBA;

Attachment #1
Attachment #2
ATTENUATION FORMULAE

Distance – Noise levels drop by approximately 6 dB for every doubling of distance from source to receiver. The following formula[1] is used to calculate attenuation due to increased distance:

$$PWL = SPL + 20\text{Log}\ (R_S/R_R)$$

where PWL = acoustical power level in decibels
SPL = sound pressure level in decibels
R_S = reference distance from source
R_R = distance between source and receptor

Barrier – Attenuation by barriers is a function of frequency; higher frequencies are more efficiently attenuated than lower frequencies. The following formula[2] applies where b>>a:

$$Ap = 10\log f + 10\log[(h^2/a)] - 17.5$$

where a = distance from source to center of berm
b = distance from center of berm to receptor
h = height of berm above line-of-sight profile
f = frequency

An attenuation of 15 dB is typically used for berms that block line-of-sight transmission of noise.

[1]National Stone Association, 1991, *The Community Noise Control Manual*
[2]Rettinger, M, 1988, *Handbook of Architectural Acoustics and Noise Control*

Attachment #2

CALCULATION OF SOUND LEVELS AT RECEPTORS

Source Noise Levels

Sound Pressure Level (SPL_{PC}) of typical portable processing plants with crushers: 69 dBA (L_{eq}) at 400 ft (measurement taken October 22, 2002 at Dalrymple Mine, Chemung, NY by Epsilon Associates).

Sound Pressure Level (SPL_{PC}) of typical primary jaw crusher: 81 dBA (L_{eq}) at 100 ft (measurement taken August 27, 1996 at Middlesex Materials Mine, Littleton, MA by Tech Environmental, Inc.).

Sound Pressure Level (SPL_{TL}) of typical loader (Caterpillar 966F) operations: 76 dBA (L_{eq}) at 50 ft (measurement taken March 11, 2004 at Darling Mine, Stanfordville, NY by Roy T. Budnik & Associates).

Sound Pressure Level (SPL_{HE}) of typical hydraulic excavator (Caterpillar 245) operations: 78 dBA (L_{eq}) at 100 ft (measurement taken 1997 at Thalle Quarry, Fishkill, NY by VibroTech).

Sound Pressure Level (SPL_{RD}) of typical rock drills: 89 dBA (L_{eq}) at 50 ft (measurement taken August 27, 1996 at Middlesex Materials Mine, Littleton, MA by Tech Environmental, Inc.).

Combined equipment at mine face or mine floor:

MINING EQUIPMENT SOURCE NOISE LEVELS

Source	Noise Level (L_{eq}) at 100 feet	Difference from 81 dBA
Loader	70	11
Excavator	78	3
Crusher/Screener	81	0

Additive Effects

Loader + Excavator 78 -70 = 8; 78 + 1 = 79

(Loader + Excavator) + Plant = 81-79=2; 81+2=83

Therefore, use of all equipment simultaneously will result in a noise source level of 83 dBA at 100 feet in the plant area.